Pollution Prevention Fact Sheet
Antifreeze Recycling & Disposal
Utah Department of Environmental Quality
Promoting a Healthy Environment

Introduction

The majority of cars use a liquid cooling system that circulates a liquid around hot engine parts and carries off heat. The liquid is called a coolant. Because the coolant in older automobiles was primarily water, the system used to be referred to as a water-cooled system. Water causes the formation of rust in the water jackets, which acts as a barrier to heat transfer. As a result, all modern cars used a coolant composed of water and additional substances. The most common name for modern coolant is antifreeze. Antifreeze is a substance that is added to a liquid usually water to lower its freezing point. Although various substances have been used in the past, nearly all of the currently produced antifreeze is manufactured with ethylene glycol and methyl alcohol. More than 95% of the antifreeze on the market is "permanent" antifreeze, containing ethylene glycol as the major constituent. The lower boiling methyl alcohol will boil away in a hot radiator and possibly leave the engine unprotected against freezing.

Most commercial antifreeze contains various additives to prevent corrosion, leaks, and damage to rubber parts and foaming. Antifreeze is not developed through the petroleum fractionating process. Although it is an automotive fluid, it will not be included in the discussion of re-refined automotive petroleum based fluids. Antifreeze can be included in some recycling programs but should not be mixed with engine oil as part of an used oil recycling or re-refining process.

Problems

Environmental Impact

Most modern automobiles are liquid-cooled and use a mixture of antifreeze and water as a coolant. Along with additives to inhibit corrosion, antifreeze is usually based on ethylene glycol, although diethylene glycol, propylene glycol, and sodium nitrate may also be used. Over time, antifreeze becomes contaminated with traces of fuel, oil, metals (such as copper, lead, and zinc particles), and dirt. It also breaks down to form acids that corrode cooling systems. When mixed with anything other than de-ionized (distilled) water, dissolved minerals in the antifreeze/water mixture form scale deposits that can block lines. Waste antifreeze may contain heavy metals such as lead, cadmium, and chromium in high enough levels to make it a regulated hazardous waste. A hazardous waste may never be dumped on land or discharged into a sanitary sewer, storm drain, ditch, dry well or septic system. It is for these reasons that coolant mixtures are periodically drained and replaced with fresh, uncontaminated coolant.

Used antifreeze is potentially dangerous in three ways: (1) Ethylene glycol is poisonous to animals and small children. The bright green color of most antifreeze, coupled with the rather

sweet taste of ethylene glycol, makes antifreeze an attractive hazard to those most at danger from drinking it. (2) Antifreeze can become contaminated with a number of hazardous substances while confined within an automobile cooling system. Anti-freeze drained from older automobiles, especially those that have not had cooling system service for a long period, may have a substantial lead content; the lead leaches from the lead-tin solder once used in radiators. If the lead content reaches 5 ppm or if the pH is 12.5 or greater, the antifreeze is considered a hazardous waste under Federal guidelines. (3) Ethylene glycol, is a highly water-soluble chemical and exerts a very high biochemical oxygen demand (BOD) on receiving waters. The effect of increased BOD is to deplete dissolved oxygen level in the water and deprive aquatic life of oxygen causing death. Propylene glycol exerts a greater BOD effect than ethylene glycol on receiving waters. It remains in the environment longer and will consume more oxygen while it is broken down; however its toxicity as a chemical is far less to aquatic and mammalian organisms than ethylene glycol.

Worker Safety

Engine coolant is also very hot when checked or removed from an engine. Because of the sticky nature of anti-freeze, burns can be particularly bad. Spill clean up to prevent slipping should be emphasized. As the coolant is poisonous, prevention from ingestion is also a concern. Heavy metal contaminants can be dangerous to human health. They are potential carcinogens and teratogens, and skin absorption or ingestion remain major health concerns with this chemical. Ethylene glycol can be irritating to the skin, eyes, and mucous membranes. It can also be toxic if inhaled. Proper personal protection equipment is therefore recommended.

Regulations

Antifreeze will be regulated as hazardous waste if the results from the Toxic Characteristics Leaching Procedure (TCLP) indicate metal contents that meet or exceed the following limits:

Metal	mg/L (ppm)
Cadmium	1.0
Chromium	5.0
Lead	5.0

Solutions

Waste Reduction

Avoid spilling when servicing. Use in-shop reclaiming machines to remove coolant prior to engine work, radiator, heater core, or thermostat removal and replacement. Use dedicated drain pans and mop buckets to segregate coolant drips and spills from other liquids in the shop.

Recycling

Why recycle antifreeze? It's Cost-Effective: recycled antifreeze is less expensive than virgin antifreeze. It saves resources. Ethylene glycol is produced from natural gas, a non-renewable resource. Waste antifreeze should be recycled either:

1. In an on-site unit,
2. By a mobile service, or
3. Off-site.

Many sewage treatment agencies responsible for wastewater treatment discourage or forbid waste antifreeze disposal into sanitary sewers. Waste antifreeze should never be disposed of down storm drains or into surface waters because it causes serious water quality problems and may harm people, pets or wildlife. Doing so is illegal and punishable by significant fines. Due to the many on-site and off-site recycling options available, recycling antifreeze is feasible in all parts of the country. Waste antifreeze can be recycled by three methods:

1. On-Site Recycling: waste antifreeze is recycled in units purchased by the facility, located on site, and operated by facility employees.
2. Mobile Recycling Service: a van or truck equipped with a recycling unit visits the facility and recycles waste antifreeze on site.
3. Off-Site Recycling: waste antifreeze is transported to a specialized recycling company; these services can also re-supply the facility with recycled antifreeze.

All waste antifreeze-recycling methods involve two steps:

1. Removing contaminants either by filtration, distillation, reverse osmosis, or ion exchange and,
2. Restoring critical antifreeze properties with additives. Additives typically contain chemicals that raise and stabilize pH, inhibit rust and corrosion, reduce water scaling, and slow the breakdown of ethylene glycol.

The type of antifreeze recycling that is best suited to a facility depends on many factors. A frequent question with the recycling of used antifreeze is, can I recycle organic acid technology (OAT) or (long-life) coolants to a degree that it is comparable to new antifreeze? In 1999, about 30 percent of new passenger vehicles and 5 percent of heavy-duty equipment were factory filled with or recycled coolants. Many antifreeze recycling units can recycle OAT. The most important factor when recycling OAT coolant is to use a technology that completely removes the

"chemistry" from the waste coolant. Once the coolant has been recycled, it may be returned to a conventional or OAT coolant depending on the additive package used. Numerous auto repair and fleet maintenance facilities have used recycled antifreeze produced from on-site recycling units and mobile and off-site recycling services for years without experiencing engine damage or other problems as a result.

Are there consumer protection and manufacturer warranty issues? As of September 1999, there is no ASTM quality standard for recycled antifreeze. However, several state agencies, for example California Weights and Measures, have issued product specifications for recycled antifreeze. Also, some vehicle manufacturers, (e.g. General Motors, Ford Motor Company, Detroit Diesel and Cummins) test and certify antifreeze-recycling equipment or have developed standards for recycled antifreeze. Because there is currently no single national recycled antifreeze standard that all recycling methods must achieve, you should select an antifreeze recycling method after discussing coolant quality specifications and vehicle warranty concerns directly with your recycling unit or service vendors. Some vendors can provide certification letters from vehicle manufacturers or state agencies, or will otherwise guarantee the recycled antifreeze they produce.

Waste Management

The determination of the hazardous characteristic of used radiator coolant has been determined by the state of California, and it is regarded in that state as a hazardous waste. In other states, it is not regarded as a hazardous waste until contaminates reach a certain levels. In addition, radiator coolant has the potential to become contaminated with chlorinated solvents and other contaminates if improperly handled or stored. It is important to protect waste radiator coolant storage from exposure to rainwater and the resulting run-off into the storm water drain or sewer system.

Radiator Coolant should not be dumped into septic systems, gutters, and storm systems or onto the ground. Used radiator coolant may be a hazardous waste and cannot be released into the sanitary sewer or storm drains!

Call your local waste treatment facility or local health department for answers to your questions concerning storm water runoff or discharging antifreeze to the sewer.

Antifreeze recycling wastes may be contaminated with metals such as lead, chromium, cadmium, copper, or zinc. Depending on the type of recycling performed; wastes may include filters, sludge or resins. As with all wastes, you should obtain data, or test the waste to determine whether it is hazardous and dispose of it accordingly. Off-site and some mobile recycling service vendors will dispose of the wastes for you. If your vendor manages your wastes for you, make sure that proper waste determination and disposal is performed.

DO

- Use dedicated antifreeze collection equipment, including funnels, transfer pans or buckets, and well maintained storage containers.

- Recycle your antifreeze through a recycling service or with on-site equipment. If this is not possible, determine the waste status of all antifreeze before disposal.
- Keep antifreeze containers closed at all times except when emptying or filling.
- Store antifreeze containers in a diked area with a sealed surface.
- Keep antifreeze containers protected from the elements.
- Keep accurate records of used antifreeze shipments for three years.

Store antifreeze in separate, closed containers marked **"WASTE ANTIFREEZE ONLY"** and **"RECONDITIONED or RECYCLED ANTIFREEZE,"** as appropriate.

DO NOT

- Mix antifreeze with any other wastes, including used oil.
- Mix radiator flush chemicals with used antifreeze. Dispose of them separately.
- Pour antifreeze on the ground, into a storm drain, septic tank, or dry well. To do so can contaminate ground water or surface water or cause problems with the operation of the septic system.

For More Information, Contact:

Your local health department or,
Division of Solid & Hazardous Waste (801) 538-6170.
Environmental Hotline (800) 458-0145
Pollution Prevention Coordinator (801) 536-4477

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